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FORREST, MICHAEL				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/570,221

**Applicant(s)**

GERLACH ET AL.

**Examiner**

MICHAEL FORREST

**Art Unit**

4162

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 22-42 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 22-42 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/55/08)  
Paper No(s)/Mail Date 4/25/2008
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 33 and 36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

2. Claim 33 recites the limitation "the NO<sub>x</sub> storage component" in line 1. There is insufficient antecedent basis for this limitation in the claim.
3. Claim 36 recites the limitation "the rich/lean and constant lean modes" in line 1. There is insufficient antecedent basis for this limitation in the claim.

### ***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 22 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Jordan(US Patent Application Publication 2003/0144143). Jordan teaches a catalyst comprising Ru as the metal catalyst supported on a Sn/Ce/Zr composite oxide (see Para 0014). Each limitation of the instant claim is fully disclosed by the prior art reference.

6. Regarding Claim 27, Jordan further teaches a catalyst which further comprises platinum or palladium (see Claim 1, Para 0021).

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 22-28 and 30-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshima(US Patent Application Publication 2003/0216254) further in view of Jordan(US Patent Application Publication 2003/0144143). Takeshima teaches a NOx purifying catalyst comprising a cerium-free oxide and a cerium-zirconium composite oxide supporting noble metal catalyst (see Para 0023). Takeshima further teaches that the cerium-free oxide can be selected from a group that comprises zirconia (see Para 0055). Takeshima further teaches that the noble metal supported on the refractory inorganic oxide is Pt, Pd, or Rh (see 0059). Takeshima does not teach a catalyst where ruthenium is the noble metal catalyst. Jordan teaches a catalyst comprising Ru as the metal catalyst supported on a Sn/Ce/Zr composite oxide (see Para 0014). Jordan further teaches that ruthenium is lower cost than precious metals such as rhodium and provides NOx reduction and CO and HC oxidation (see Para 0010). Jordan further teaches that ruthenium is thermally stabilized by zirconia (see Para 0011). It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the ZrO<sub>2</sub> or Ce/Zr oxide

supported noble metal catalysts taught by Takeshima for Ru as taught by Jordan to obtain the lower costs and effective oxidation/reduction efficiency of Ru.

9. Regarding Claim 23 and 30, Takeshima further teaches a catalyst where the cerium-zirconium composite oxide further comprises a rare earth element selected from the group comprising La, Sm, Nd, and Gd (See Para 0043).

10. Regarding Claim 24, Jordan further teaches a catalyst which further comprises promoter metals selected from the transition series of the periodic element (see Para 0019).

11. Regarding Claim 25, Takeshima further teaches in example a catalyst where zirconia is impregnated with cerium nitrate and subsequently the noble metal catalyst. (see Example 1, Paras 0064 and 0067)

12. Regarding Claim 26, Jordan further teaches a catalyst where promoter metals of the transition metals are deposited onto the Sn/Ce/Zr oxide layer (See Para 0019).

13. Regarding Claim 27, Jordan further teaches a catalyst which further comprises platinum or palladium (see Claim 1, Para 0021).

14. Regarding Claim 28, Jordan further teaches a catalyst where the noble metal comprises from about 1 to 50 weight percent of the total catalyst and the metal oxides comprise 50 to 99 weight percent of the total catalyst (see US Patent Application Publication 2003/0139290 as incorporated into Jordan in its entirety, Para 0008).

15. Regarding Claim 31, Takeshima further teaches a catalyst where the cerium content of cerium-zirconium composite oxide is preferably from 0.5 to 10 mol% of the composite (see Para 0042). The weight percent of the Ce in the composite at 10 mol% is 14.5wt%.

16. Regarding Claim 32, Takeshima further teaches a catalyst that further comprises a NO<sub>x</sub> storing material (see Para 0060).
17. Regarding Claim 33, Takeshima further teaches a catalyst where the NO<sub>x</sub> storing material is selected from a group of metals that includes barium and strontium (see Para 0060).
18. Regarding Claim 34, Takeshima further teaches a catalyst where the NO<sub>x</sub> storing material is supported on oxides that include alumina, silica, silica-alumina, and titania (see Para 0046 and 0055).
19. Regarding Claim 35, Takeshima further teaches a catalyst in the form of a honeycomb monolith (see Para 0049). Jordan also teaches a catalyst in the form of a honeycomb monolith (see Para 0019)
20. Regarding Claim 36, Takeshima further teaches the catalyst used in an exhaust system where the fuel is usually burned in the lean condition and temporarily or intermittently burned in the rich condition (see Para 0017).
21. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshima and Jordan as applied to claim 22 above, and further in view of Hagemeyer (US Patent Application Publication 2004/0180784). As applied to Claim 22, Takeshima and Jordan teach a catalyst comprised of Ru supported on an oxide of Zr or a composite oxide of Ce and Zr. Takeshima and Jordan do not teach that the Zr is present in a monoclinic phase. Hagemeyer teaches a water gas shift catalyst comprising Ru supported on an oxide of Zr (see Para 0063-0066). Hagemeyer further teaches that zirconia is a preferred carrier and monoclinic zirconia is particularly preferred (see Para 0100). Hagemeyer teaches that when monoclinic zirconia is used as a carrier

the catalyst has enhanced activity at lower temperature conditions (see Para 0100). It would have been obvious to one of ordinary skill in the art at the time of the invention for the zirconia carrier in the catalyst taught by Takeshima and Jordan, to exist in a monoclinic phase as taught by Hagemeyer to enhance catalytic activity at lower temperatures.

22. Claim 36-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuchitani(US Patent 5,756,057) and further in view of Jordan. Tsuchitani teaches a method of purifying exhaust gas from a lean-burn engine in a rich/lean and constant lean mode. Tsuchitani further teaches a method using a catalyst comprised of a refractory inorganic oxide and noble metal catalyst. Tsuchitani further teaches that the refractory inorganic oxide is selected from a group consisting of alumina, titania, zirconia, ceria, lanthana, silica, or mixtures thereof. Tsuchitani further teaches a catalyst where the noble metal catalyst is selected from a group consisting of Pt, Pt, Rh, and Ru. Tsuchitani does not specifically teach a method using a catalyst comprised of Ru on zirconia or ceria-zirconia composite. Jordan teaches a catalyst comprising Ru on a tin-ceria-zirconia composite (see Para 0014). The catalyst taught by Jordan is low cost and is an effective three-way catalyst. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate into the method taught by Tsuchani, a catalyst comprising Ru and Ce/Zr composite oxide as taught by Jordan to achieve low costs and effectively catalyze NO<sub>x</sub>, CO, and HC.

23. Regarding Claim 37, Tsuchitani further teaches a method where NO<sub>x</sub> reducing agent is introduced by creating an air-rich level and the reduction conditions occur 0.1 to 20 seconds at

intervals of 7 seconds to 60 minutes (see col 3, lines 2-24). Therefore, Tsuchitani teaches a ratio of lean cycles to rich cycles of at least 10:1 and lean-cycle duration of 7 seconds to 60 minutes.

24. Regarding Claim 38, Jordan further teaches that ruthenium is capable of reducing NO<sub>x</sub> and oxidizing CO and HC (see 0010).

25. Regarding Claim 39, Jordan further teaches a catalyst used in automotive catalytic converter, diesel engine, and alternative-fuel emissions applications (see Para 0011).

26. Regarding Claim 40, Tsuchitani further teaches a method where a three-way catalyst is used in an automotive catalytic converter and as such is expected to be located underfloor (see Para 0011).

27. Regarding Claim 41, Tsuchitani further teaches a method where a NO<sub>x</sub> analyzing meter is used to determine when introduce reducing agent is introduced based on NO<sub>x</sub> concentration in the gas and the capacity of the catalyst to absorb NO<sub>x</sub> (see col 5, line 40 to col 6, line 11).

28. Regarding Claim 42, Tsuchitani further teaches a method where a three-way catalyst is used in combination with a catalyst comprising a NO<sub>x</sub> storage component (see col 2, lines 52-55).

### ***Conclusion***

29. Claims 22-42 are pending. Claims 22-42 are rejected.

30. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. Li (US Patent Application Publication 2006/034740) teaches a lean NO<sub>x</sub> trap and method of using. The trap comprises Ru in place of higher cost metals such as platinum. It claims the benefit of provisional application 60/600,933 filed on Aug. 12, 2004.



b. Li (US Patent Application Publication 2006/034741) teaches a lean NO<sub>x</sub> trap and method of using. The trap comprises Ru in place of higher cost metals such as platinum.

It claims the benefit of provisional application 60/600,933 filed on Aug. 12, 2004.

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL FORREST whose telephone number is (571)270-5833. The examiner can normally be reached on Monday - Thursday, 9:00am - 4:00pm.

32. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on (571)272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

33. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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